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(54) Electronic module for ignition systems of motor vehicles

(57) An electronic module structure (4) is made up by a metallic body (5, 7), working as thermic radiator, which is fixed to the ignition distributor body (1) of a motor vehicle by means of a heat insulating support (6). Thus the module temperature is not affected by the distributor temperature and, owing to the effect of the radiator body (5, 7), it is kept within values compatible with the temperature of its components.

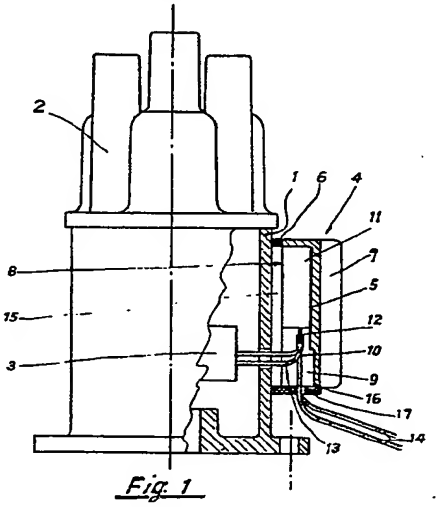

Fig. 1

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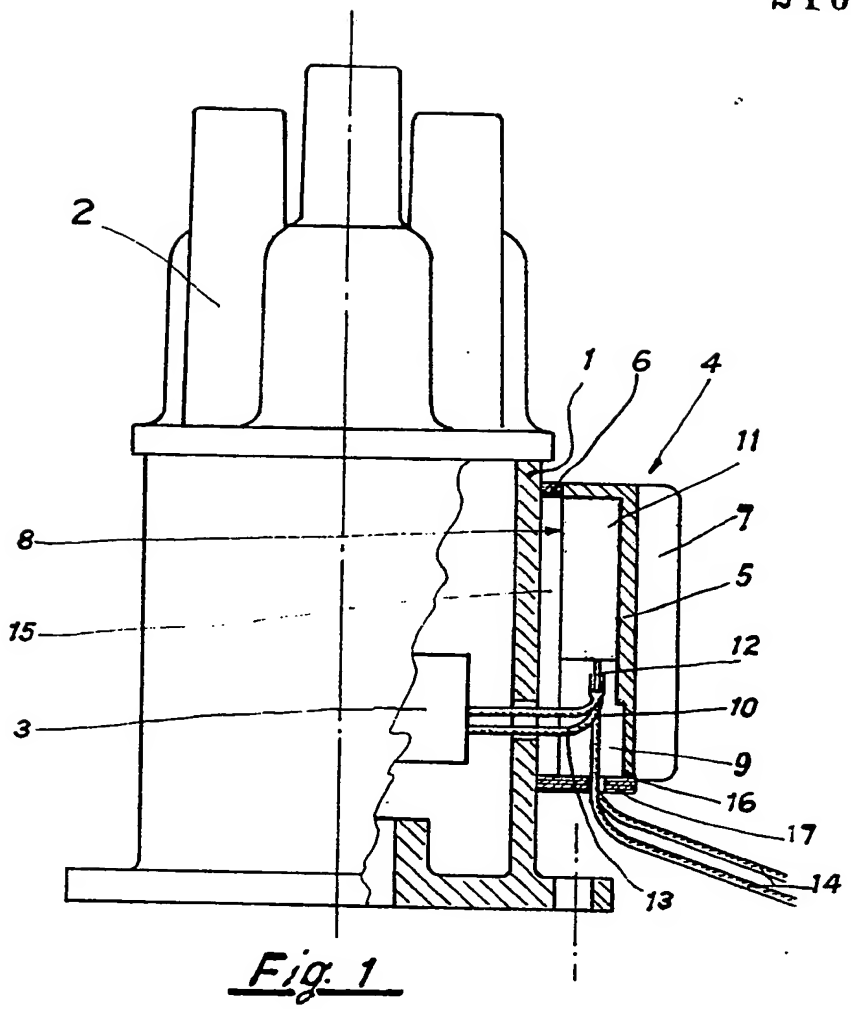

Fig. 1

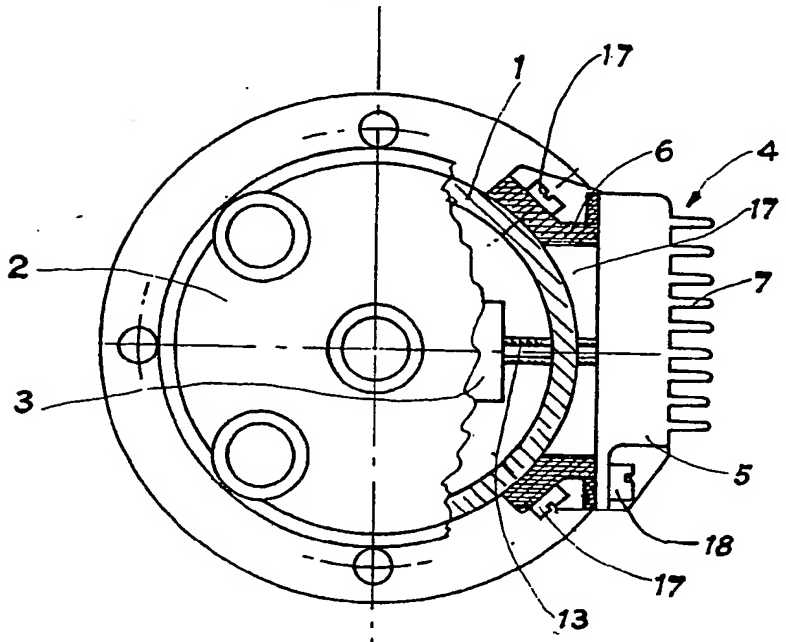

Fig. 2

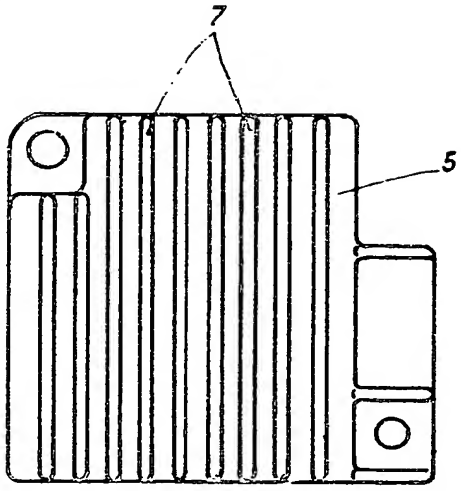

Fig. 3

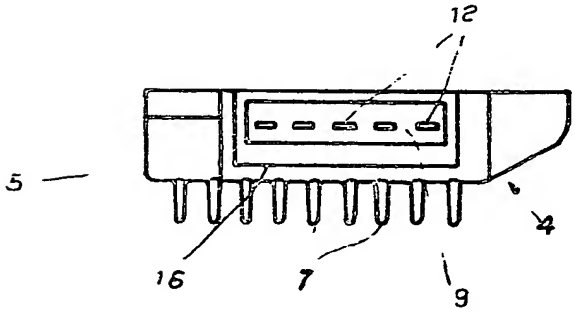

Fig. 4

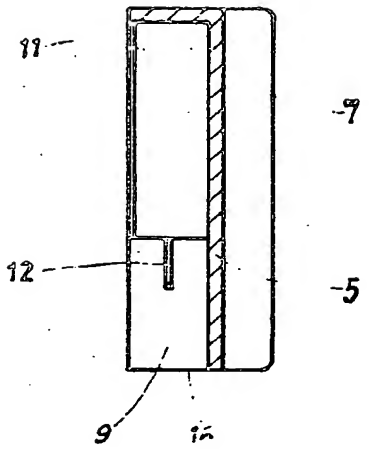

Fig. 6

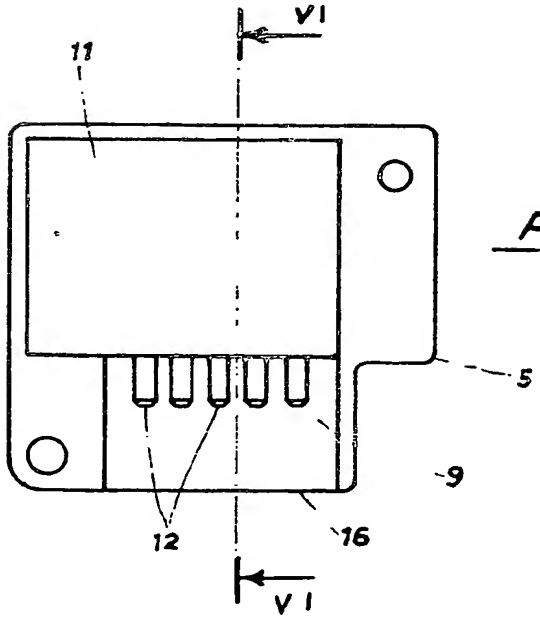

Fig. 5

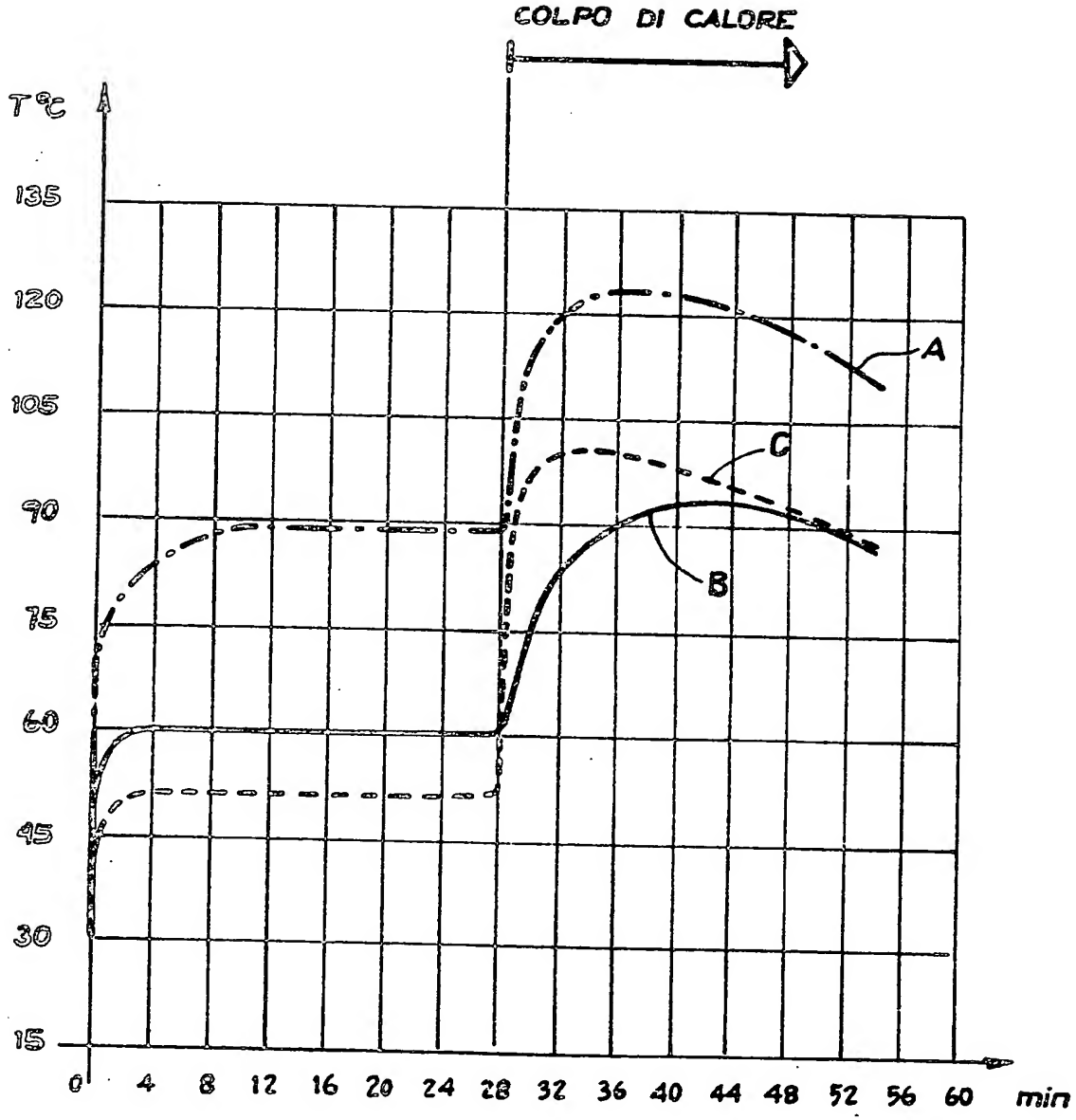

Fig. 7

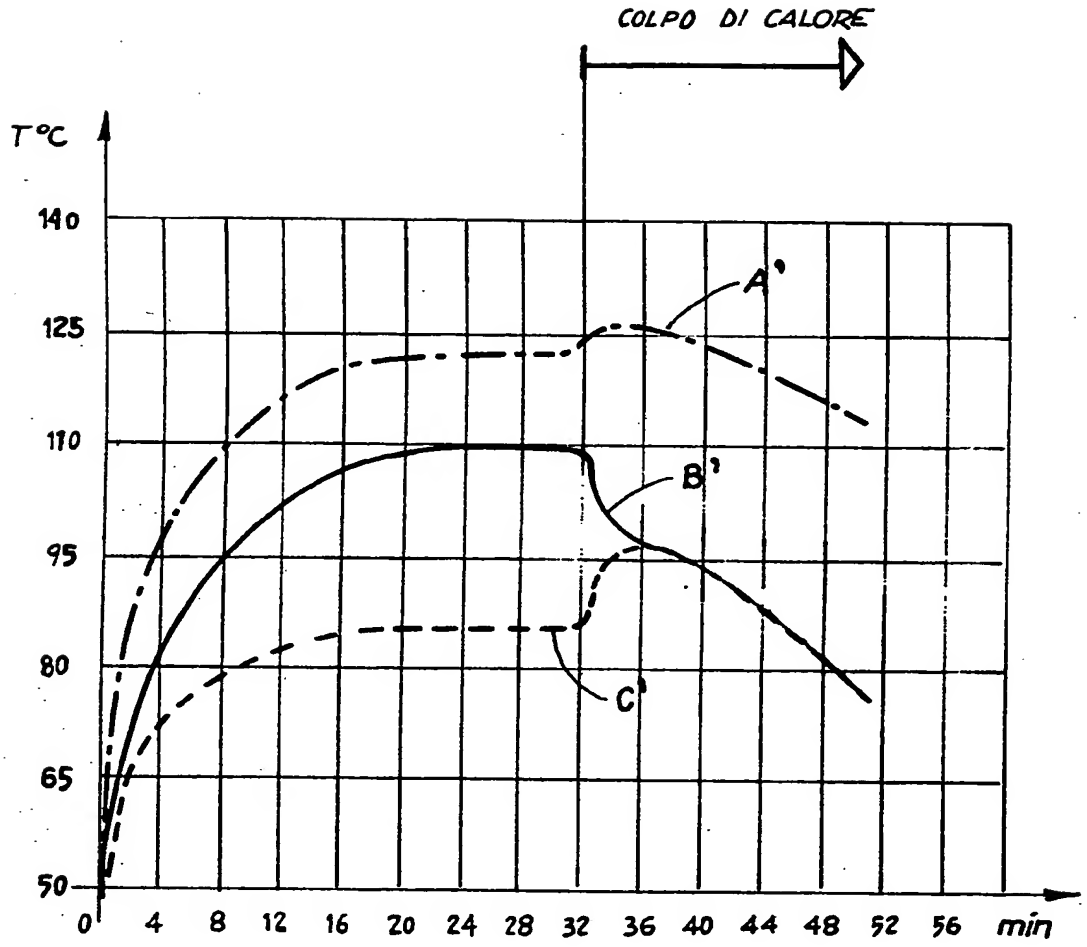

Fig. 8

SPECIFICATION

Electronic module for ignition systems of motor vehicles

The present invention relates to an electronic module structure and its relevant assembly in the ignition distributor for internal combustion engines, particularly for motor-vehicles.

As it is well-known, the electric motor-vehicle ignition plants are supplied with an electronic module that forms the ignition bobbin control device and, for getting this object, it is electrically connected, on one side, to the distributor propulsor and, on the other side, to the vehicle battery.

One of the problems related to the electronic module design is to avoid its extreme heating that is harmful for its electronic components.

To keep the heating within acceptable limits, the well-known devices are manufactured using a metallic plate that is assembled in contact with a metallic support suitable for dissipating the heat generated by the module. Then the electric connection between the module and the distributor is carried out by a cable.

Yet this solution requires a proper cooling support and a connection cable whose presence involves obviously some problems concerning its cost and overall dimensions.

With the aim of eliminating the proper support and the cable, it was proposed that the module were attached directly to the distributor. In this way the metallic plate of the module is directly in touch with the distributor body that, further, can be used as heat dissipating support.

But, during the practical running, the distributor body is heated by the thermic motor on which it is assembled and therefore the direct contact between the metallic module plate and the distributor body produces the heat passage from the distributor to the module, whose temperature depends not only on the heating of its electronic components, but also on the distributor heating.

In practice the module is substantially kept at the distributor temperature; now, if this condition does not produce drawbacks during the vehicle ride, as the natural ventilation assures a sufficient cooling of the distributor and then of the module, it is no more acceptable when the vehicle stops and the motor is still running, particularly after a ride in speedway or in slope, as the distributor temperature can achieve, when the ventilation lacks and owing to the "heat shock", very high peaks that are not compatible with the electronic module components.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provide an electronic ignition module structure and its assembly on the ignition distributor which has none of the above-mentioned drawbacks whatever the vehicle ride and the thermic engine running conditions are. Particularly the object of the invention is to keep the module temperature and its gradients independent of the distributor ones, keeping the temperature within values compatible with its electronic components.

The above mentioned object of the present invention is achieved by an electronic module structure made-up by a metallic body working as thermic radiator, suitable for dissipating the heat generated by the electrode module components towards the outside and fixing this structure to the ignition distributor body by means of an intermediate heat insulating means, so that it is eliminated the direct heat transmission of the thermic engine through the distributor body.

According to a simple preferred embodiment of the invention, the radiator body shows the shape of an open box, whose inside is partially occupied by the electronic module components and it is partially available for the electric connections. Preferably the thermic insulation means is made-up by a support have a frame shape that forms a closing surface of the internal side of the radiator body for getting the module protection.

Further advantages and characteristics of the module structure and assembly will be better explained in the following description and annexed drawings that refer to a preferred (but not limitative) embodiment of the invention.

BRIEF SUMMARY OF THE DRAWINGS

The drawings show:

– Fig. 1 is a lateral schematic view of an ignition distributor represented in partial cutaway view in the area of the electronic module.

– Fig. 2 is a plan view of the distributor shown in Fig. 1, with cutaway representation of the electronic module area.

– Fig. 3 is a plan view of the external module side.

– Fig. 4 is a view of the modular system shown in Fig. 3, illustrating the terminals zone.

– Fig. 5 is a plan view of the internal module side.

–Fig. 6 is a cutaway view along the line VI-VI of the module shown in Fig. 5.

– Fig. 7 shows by means of the diagram T (centigrade degrees) – minutes (min.), the temperature variation of the distributor body, of the electronic module body and of the environmental temperature, that occur during a vehicle ride condition.

–Fig. 8 shows the diagram indicated in Fig. 7 considering another vehicle ride condition.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The ignition distributor is supposed to be assembled on a thermic engine of a vehicle and is shown schematically in the Fig. 1 and 2, in which: 1 shows the cylindrical body, normally made of aluminium, 2 indicates the distributor cap and 3 is the propulsor, which can be of any well-known type, e.g. of the magnetic type (magnetic propulsor), mechanical type (contact breaker) or using the Hall effect.

4 shows the electronic module including, according to the invention, a metallic box or body 5 made of heat dissipating material, e.g. aluminium, that is connected to the body 1 of the distributor by means of a heat insulating means 6.

The body 5 shows the shape of an open box with at least an external surface supplied with cooling fins 7.

The inside of the box 5 is partially – see 8 – occupied by the electronic module components and is partially – see 9 – at disposal for the electric connections 10.

The electronic module components are buried into a mechanical protection resin and form together with it

a mass 11 placed in the box space 8.

The module terminals 12 are connected, on one side, to the propulsor 3 by the connections 13 and, on the other side, to the electronic vehicle plant by means of the connections 14" and, in particular, to the ignition bobbin and the feeding battery (not shown).

The electronic module function is well-known: it processes the phase signal transmitted by the propulsor 3 and disconnects the current stream in the bobbin at the ignition moment. To make easier the access to the space 8, the body 5 shows, on the bottom, a lateral opening 16 that will be closed by an insulating means wall 6, as described afterwards.

The box body 5 together with the wall 11 is assembled turning the open side towards the body 1, using a plate 6 that sets-up the heat insulating means interposed between the said body 1 and the module 4.

In such a way the distributor heat cannot be transmitted to the module by conduction and therefore the temperature of this last one is practically independent of the distributor temperature in all running conditions of the thermic engine and of the motor-vehicle ride.

Naturally, for being able to satisfy this condition, it is necessary to select suitably the thickness and the material of the insulating plate 6, e.g. thermosetting polyesther.

As the module 4 is no more influenced by the distributor heating, its temperature will depend only on the heating of its electronic components.

To keep this heating within allowable limits, the radiator body 5 is supplied, as above said, with cooling fins 7 whose dispersing surface is obviously calculated to guarantee this condition.

Further the plate 6 has the object of establishing a protecting surface for the electronic module part and further for closing the spaces 8 and 9.

Considering a simple embodiment, the plate 6, as the Fig. 1 and 2 show, has the shape of a frame whose edge, on one side, is in touch with the distributor body 1 and, on the opposite side, is in touch with the internal edge of the radiator body 5.

The frame allows to have at disposal a space 15 (see Fig. 1) between the body 1 and the module 4 that, besides making easier the introduction and connection operations of the cables 13 and 14, carries out an air space between distributor and module, which is suitable for limiting the heat transmission between these parts.

Furthermore, to make easier the access to the space 9 during the above mentioned operations, the radiator body 5 shows a lateral opening 16, or a bottom opening which, after the module assembly to the distributor, is closed by a protruding wall 17, that is a part of the plate or frame 6. In such a way the inside of the box 5 and particularly the space 9 are protected against water splashes, foreign bodies, etc..

The Figures from 3 to 6 show the module 4 as a sole unit, i.e. seperated from the distributor. The above mentioned figures use the same reference symbols for the corresponding parts. The module 4 structure assembly on the distributor body by means of the insulating frame 6 can be made in whatever well-known way, e.g. by screws, rivets or the like.

The Figures 1 and 2 show an assembly of the frame 6 to the distributor body by means of the screws 17, and of the module body to the frame 6 by means of the screws 18.

Some practical tests were carried out to verify the heat transmission of the electronic module manufactured and assembled according to the invention.

The distributor with relevant module was assembled, during the tests, in a thermic engine for motor-vehicle in ride at the environmental temperature of 30°C.

The results of these tests are shown in the diagrams of the Figures 7 and 8 in which the curves A-A', B-B' and C-C' show respectively the temperature variation of the distributor body 1, of the module body 5 and of the distributor surroundings, e.g. the space under the engine bonnet, versus time.

TEST NO. 1

It is shown in the Figure 7.

It relates to the temperature surveys made on a motor-vehicle in ride on speedway at the maximum speed and after its stop 28 minutes from the start.

It can be immediately noticed that the curve B, showing the temperatures of the body 5 of the module 4, both during the ride and after the stop of the vehicle, is always under the curve A.

A short time before the stop, the body 1 temperature (see curve A) does not exceed 90°C and this is due to the natural ventilation produced by the vehicle movement.

But, after a ride of 28 minutes, at the vehicle stop moment, the curve A undergoes a quick increase due to the "heat shock" that occurs in the distributor body owing to the ventilation lack and the heat transmitted by the thermic motor.

During this phase, the temperature of the body 1 reaches and exceeds 120°C.

The tricks suggested by the invention, that foresee, on one side, the thermic insulation of the module 4 from the distributor body by means of the frame 6 and, on the other side, an efficient module heat dissipation by means of the finned body 5, the curve B, as the diagram shows, is kept under the curve A of 25-30°C, both during the continuous vehicle ride and after the vehicle stop.

Further the thermic gradient taken on the module during the start phase of the "heat shock" (slope gradient of the curve B in comparison with the curve A) is notably lower than the gradient that would be got when the module is directly assembled on the distributor.

These two effects of lower temperature and lower thermic gradient allow to get a notable advantage in the exercize reliability of the electronic module components.

Further the diagram shows the curve C that represent, as above said, the temperature variation in the space which holds the distributor.

The course of this curve justifies the one of the curve B, that depends strictly on the environmental air temperature.

TEST NO. 2

It is shown in Fig. 8.

It refers to the temperature surveys made on a motor vehicle during a mountain ride with maximum load and after its stop. Also in this case it is tested a

curve B', always under the curve A', even if the temperature values are higher than the ones of the curves A and B of the diagram shown in Fig. 7, owing to the heavier vehicle ride conditions and the reduced ventilation of the engine space caused by the low speed. This produces a lower temperature increase after the stop as regards the curves A' and C' and the consequent quicker adaptation of the curve B' to the curve C'.

CLAIMS

1. Electronic module structure and its assembly in the ignition distributor for internal combustion engines, particularly for motor vehicles, characterized in that the structure is made up by a metallic body (5), working as thermic radiator, which is fixed to the distributor body (1) through an intermediate insulating means (6); this radiator being able to dissipate the heat generated by the electronic module components (11) towards the outside.

2. Electronic module structure according to Claim 1, characterized in that at least a radiator (5) body surface shows some cooling fins (7) on the external side.

3. Electronic module structure according to Claims 1 and 2, characterized in that the radiator body shows the shape of an open box whose inside (8) is partially occupied by the electronic module (11) components and is partially available for the electric connections (10).

4. Electronic module structure according to Claim 3, characterized in that the box shows a lateral opening (16) for the access to the space (9) of electric connections (10).

5. Electronic module structure according to Claims 1 and 3, characterized in that the intermediate heat insulating means is made-up by a plate (6), which determines a protection surface of the inner side of the box body holding the module (11).

6. Electronic module structure according to Claims 4 and 5, characterized in that the plate has a frame shape (6), showing a protruding wall (17) for the closing of the lateral opening (16) of the box body and that realizes an air space (15) between the distributor body (1) and the module (11).

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